The American Biology Teacher

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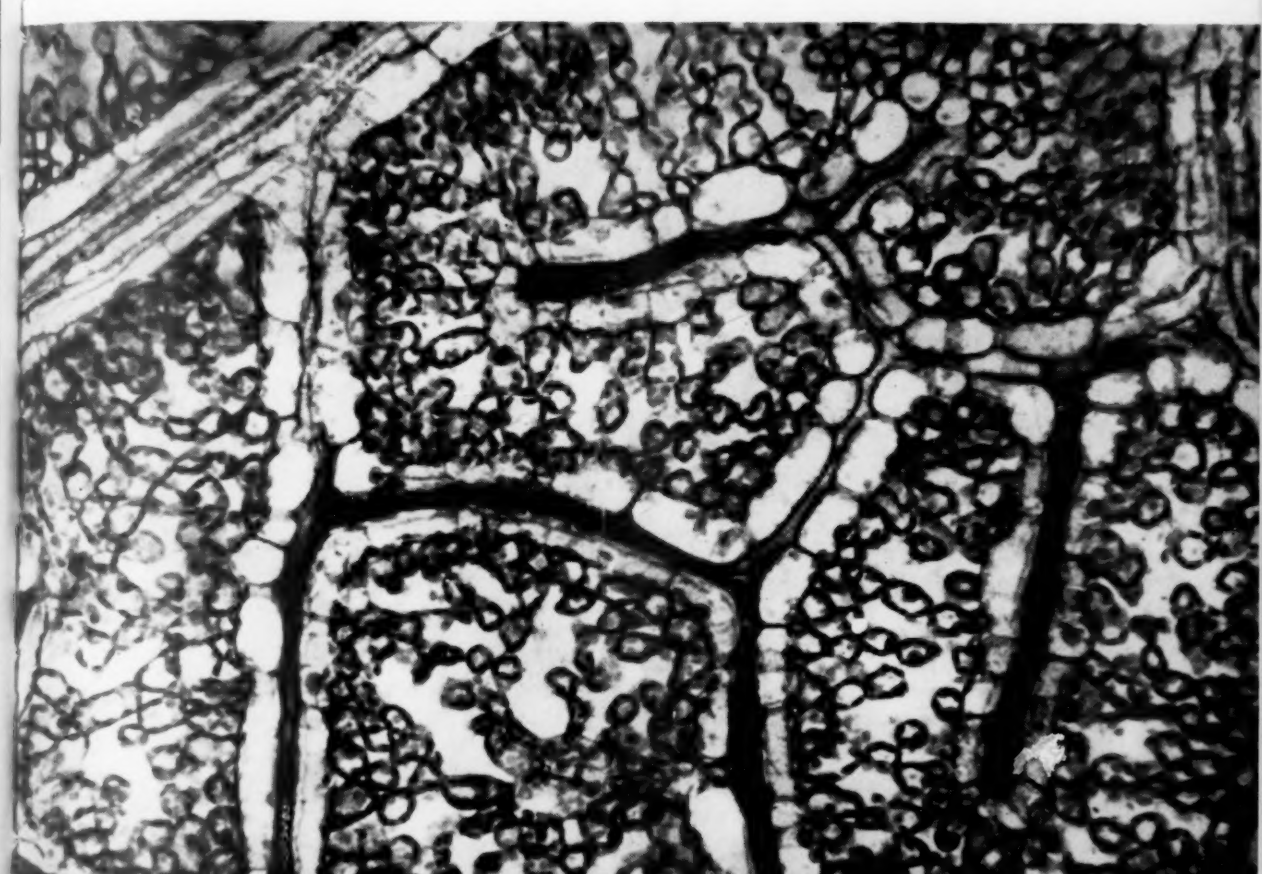

Hematology . . . Small Animal Cage

Desmids . . . Secondary Root Demonstration

TABLE OF CONTENTS

COVER PHOTO

Paradermal section (cut parallel to the epidermal layers) of the wild sunflower (*Helianthus grosseserratus*). Minor veins and their endings ensheathed by the border parenchyma, as well as mesophyll (probably both palisade and sponge), can be seen. Photograph by Richard Armacost.

THE AMERICAN BIOLOGY TEACHER

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President Arthur J. Baker announces that Paul Webster, biology teacher at Bryan City High School, Bryan, Ohio, has been elected Secretary-Treasurer of the National Association of Biology Teachers, effective immediately. John Harrold, formerly in this office, asked to be relieved of his duties.

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Hematology

MELVIN A. HINTZ
South Milwaukee High School
South Milwaukee, Wisconsin

One of the most interesting and fascinating activities which can be sponsored by any biology department is hematology. If we define hematology as that branch of medicine having to do with the study of the blood, the blood-forming tissues, and the diseases of the blood, it is obvious that the study of hematology is not on a high school level, so would seldom be found as a high school activity. However, our students chose hematology as the name for their activity because they felt that any studies about the blood could be classed as hematology. How do we, then, justify such an activity in high school? Two factors entered into the organization of the activity in our high school. First, most biology classes learn about some phases of human physiology, especially the blood and its circulation through the body. There are always some students interested in reading some extra information on this topic who become interested in Rh factor, coagulation time, or the types of blood. Questions arise about how these tests are made. The activity in our high school came largely from this natural curiosity. Second, in our city there is a blood bank. Fortunately, the high school gym was used by the mobile blood center when it visited the community to get blood for the blood bank. The interest in this community undertaking on the part of both parents and students added stimulus to the organization of the hematology activity.

The first year the activity was organized, the group met once a week after school. The group was so large, in spite of after school time required, that the next year the activity was placed on the regular activity schedule which meets at three o'clock once a week. The first year we performed three operations: determining type of blood, coagulation time of blood, and red blood-cell count. The second year, the white blood-corpuscle count and per cent of haemoglobin in the blood were added operations. The third year, the group also included determination of Rh factor and haemoglobin determination was improved by the use of an Hb meter instead of the Tallquist scale. Due to the lack of equipment, we could not make tests for more than two students during an activity period. At the beginning of the fourth year we felt that if we had two more counting chambers (haemacytometers) and more pipettes we could do blood studies for more students per period. A committee from the activity presented the problem of lack of funds to the Student Council. The Council granted the necessary funds.

Last year, which was the eighth year of operation, the students wanted to know if they could get a sphygmomanometer so that they could take blood pressures. The apparatus was quite expensive, and again we went to the Student Council. The profits from the coke machines were granted to the Hematology Activity provided the members of the activity took the responsibility of seeing to it that bottles were returned to the empty bottle rack. These funds made it possible for us to purchase a pipette shaker and supplies of sera for blood typing and Rh factor determination in addition to the sphygmomanometer. At present there is enough money in the activity fund to take care of all the supplies which will be needed next year.

Because best results have been obtained if the membership in the activity is limited to fourteen each day, only juniors and seniors are generally accepted. Those students interested in future work in medicine, nursing, laboratory technician, or related vocations are given preference. The work is divided so that each student has something to do each activity period. Work assignments are alternated so that a student does something different each week and repeats the various operations every seven weeks. Each member is

Students study different aspects of hematology.

given an assignment sheet which tells him what he is to do each time he comes to the activity period. These sheets have the following student responsibilities listed:

Director: Is in charge of students who come to have their blood studied. He directs them to the place where the tests are made and sterilizes the finger so that an aseptic puncture can be made with a lancet.

Supervisor: Supervises the operations and checks all results.

Recorder: Keeps a record of the results and also makes out the report which is given to each student whose blood is checked.

Rh Factor: Determines the Rh factor.

Typing: Determines the blood type.

Haemoglobin: Determines the haemoglobin per cent in the blood.

Red blood-cell dilution: Takes a sample of blood in a Thoma pipette and makes the proper dilution with Hayem's solution.

Red blood-cell count: Charges the haemacytometer and with the aid of a microscope counts the blood cells.

White blood-cell dilution: Procedure same as the red blood-cell dilution except uses white cell diluting fluid.

White blood-cell count: Same as red blood-cell count except uses the counting areas for white blood cells.

Coagulation time: Draws blood into a capillary tube and after 2 minutes breaks off a small piece every ½ minute until blood is coagulated.

Pressure: Takes blood pressure. One week the right arm is checked, the next time the left arm is used.

Clean pipettes: A suction apparatus is used to clean and dry the pipettes.

Supplies: Takes care of all supplies and sees to it that there are sufficient materials for all operations.

The supervisor grades each student on his particular assignment for the day and turns in all of the assignment slips to the teacher who goes over them and assigns special help to those students who might need it. Using the foregoing arrangement of work assignments, we can take care of four students for blood study each period. It is true that some of the operations are not very technical, never-the-less they are essential to the entire program. Students like the change of assignment each week and feel that this arrangement makes it possible for more members to join in the activity.

Students ask permission to come in to have the various tests. We ask them to come the same period on two successive weeks. For example, those students who come Tuesday at three o'clock one week, will also come on

Tuesday at three o'clock the following week. The first day blood pressure is taken, coagulation time is determined, and red and white blood-cell counts are made. The second day blood pressure is taken again, and Rh factor, haemoglobin per cent, and blood type are determined.

One objection to an activity of this type is the need for certain special equipment, but this may be partially overcome by having some of the equipment made by the students. For instance, an Rh typing box and capillary tubes for determining coagulation time can be made in the laboratory. Hayem's solution and white-cell diluting fluid can be made in the chemistry laboratory.

Some of the essentials for starting an activity are as follows: compound microscope; haemacytometer; Thoma pipettes; blood typing serum; Tallquist haemoglobin scale or Hb meter; Rh blood typing box and Rh serum; lancet or needle; small beakers; alcohol; cotton; medicine droppers; glass slides; tooth picks, etc.

When students who have been in for the tests are given the report of our findings, they are reminded that the results are obtained by students learning various techniques so the results are not guaranteed as absolutely accurate. Should we find anything which is not normal we recommend that the student consult a doctor. Some of the local doctors have been very helpful. They have given us books to read, and one sent his technician to school to demonstrate how the various tests are made. During an open house demonstration one of the doctors complimented the group on its work and even suggested other tests that could be included.

An activity of this nature can be started by any biology teacher who has had some teaching experience and is capable of supervising students in a laboratory. There must be effective laboratory descipline. Students must be impressed with the seriousness of their work or results will not be satisfactory.

After nine years of operation in our school we still have two groups meeting each week, and hematology continues to be one of the most popular activities. Once organized and running smoothly the activity advertises itself. There is always a waiting list. Students who were members as juniors will generally join again in their senior year. The second-year members are helpers for the new ones. This arrangement speeds up operations to such an extent that we can accomplish more than would be the case if everyone had to watch a demonstration and then wait his turn to perform an operation. The activity is popular because students feel that they are learning something which will help them in their future work.

Desmids

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Desmids have long been favorite objects of study for those delighting in beauty as seen through the microscope. Both the amateur and the professional alike are attracted by their symmetry and bizarre shapes. (Figs. 1-3) In addition to their beauty and uniqueness, they have invited investigation because of the ever present questions of evolution within their own group and their relationships to other algae. Whatever the reason, they continue to be an intriguing group of organisms to observe and study in biological research.

The name desmid comes from the Greek word *desmos* meaning a chain, and refers to the fact that many members of this group occur in chains, which are more properly called filaments. Many new genera were discovered which were closely related to those original members. Therefore, the term desmid has gradually become the common name of

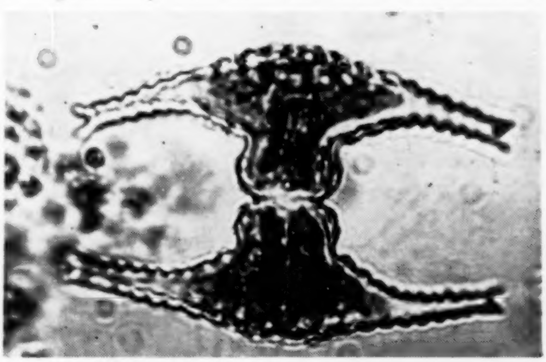

FIGURE 1—Front view of *Staurastrum cyrtocerum* var. major.

all the organisms now classified in three different families. Consequently, the group includes filamentous forms, members developing into amorphous colonies, as well as the many which exist as a single cell. The total number of different desmids includes about 4000 species. Of these, 41 make up the Mesotaeniaceae; about 20 are in the Gonatozygaceae; and the remainder, about 3900 species, belong to the Desmidiaceae. These families are members of the order Zygnematales which also includes the well known genus *Spirogyra.*

The desmid cell typically consists of two symmetrical half-cells, called semicells, separated by a median, constricted zone, the isthmus. (Fig. 1) The incision caused by the isthmus between the semicells is called the sinus and may be narrow, nearly closed, or have various degrees of divergence. The nucleus of the cell is located in the isthmus and is embedded in cytoplasm. In those desmids lacking a median constriction the nucleus is centrally located.

There are two distinct series of desmids, Saccoderm and Placoderm, which are divided mainly by a fundamental difference in cell wall structure. The Saccoderm desmids (Mesotaeniaceae) have smooth walls composed of a single piece and without any pores. These desmids are not medianly constricted but many have median, girdle bands. On the other hand, the Placoderm desmids (Desmidiaceae) have a cell wall consisting of two overlapping halves which come together at the median constriction of the cell. Their wall perforations are arranged in rows which are in narrow grooves. These minute perforations exudate a mucilaginous material that surrounds the cell. This process of exuding the mucilaginous substance frequently results in cell movement. The walls of the Saccoderm series are plain and usually devoid of ornamentation. The cell wall of a Placoderm desmid may be decorated with spines, pits, furrows, granules, warts, or protuberances. (Figs. 1-3) In addition, the chemical composition of the wall in the two series can be contrasted. The cell wall has two concentric layers in the Placoderm series. The external layer is composed of cellulose, while the internal layers is cellulose impregnated with a pectic compound. Commonly, the in-

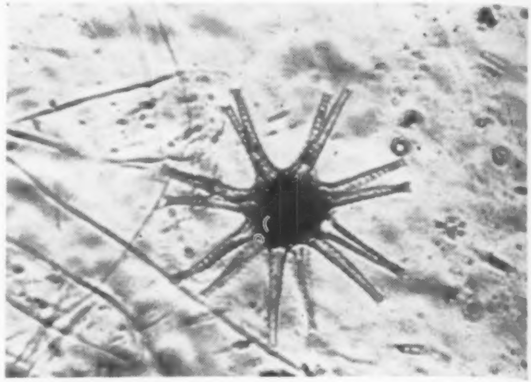

FIGURE 2—End view of *Staurastrum Ophiura* showing radiating arms.

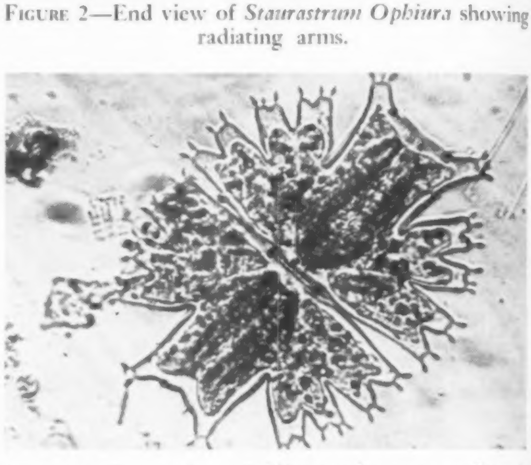

FIGURE 3—Front view of *Microsterias crux melitensis* showing biparted lobelets.

ternal wall layer is impregnated also with iron compounds. The Saccoderm series have cell walls consisting of two or three layers. The internal layer is cellulose, whereas the external wall layer is pectose. If there is a middle layer it is largely pectose with little or no cellulose.

The lone pigment in the desmids, with few exceptions, is chlorophyll. Moreover, the chlorophyll *a*, chlorophyll *b*, and the associated carotinoids, carotene and xanthophyll, in these algae are found in the same proportions as they are in the higher green plants. Therefore, desmids are capable of manufacturing their own carbohydrate foods which makes them autotropic plants, i.e., independent plants. The chlorophyll is localized in plastids called chloroplasts, which are diverse in shape. They may be stellate, ribbon-like, spiral, cone-shaped, geminate, or elaborately lobed. (Figs. 1 & 3) A number of genera have cells with only a single chloro-

plast but in the majority of the genera the chloroplast is symmetrically doubled.

Asexual reproduction in the desmids is accomplished in a peculiar manner. Cell division begins with the nucleus first undergoing division. Accompanying nuclear division there is sometimes an elongation of the chloroplast, which then divides. In the Placoderm desmids this elongation and division of the chloroplast is not evident. The isthmus or median part of the cell next elongates, and a constriction is formed between the two new nuclei. At this constriction a wall is laid down across the cell. Each half of the isthmus then begins to enlarge and grows into a new semicell the size of the mother semicells (Fig. 4). Along with the enlargement of the new semicells there is the dissolution of the middle lamella between them. In a few species the daughter cells remain united, and by repeated division give rise to a filamentous colony. When the new halves are fully developed cell division is complete. In this way each daughter cell contains one new half and one old half.

Sexual reproduction in desmids is brought about by a process of isogamous reproduction in which two entire protoplasts behave as gametes. This process is called conjugation and it may occur in two different ways. In the Mesotaeniaceae and most of the Desmidiaceae the process is initiated by two individuals coming into a juxtaposition, becoming enclosed in a common gelatinous matrix, and each producing a conjugation tube. The conjugation tubes elongate, unite, and then the middle septum dissolves so the two protoplasts can meet in the center. The protoplasts fuse to form a zygospore. Usually this zygospore has a cell wall composed of three layers. The internal layer is thin and colorless, the median layer is thicker and often brown in color, while the outer, cellulose layer is frequently covered with spines, warts, or other outgrowths. In other desmids conjugation tubes are absent. The cells rupture at the isthmus and the amoeboid protoplasts escape, fuse and a zygospore is formed (Fig. 5).

Upon germination of the zygospore the nucleus divides twice. During these divisions meiosis takes place. Two new daughter cells are produced. Each contains one chloroplast and two nuclei, but one nucleus subsequently degenerates. In one genus the zygospore occasionally develops into four new individuals.

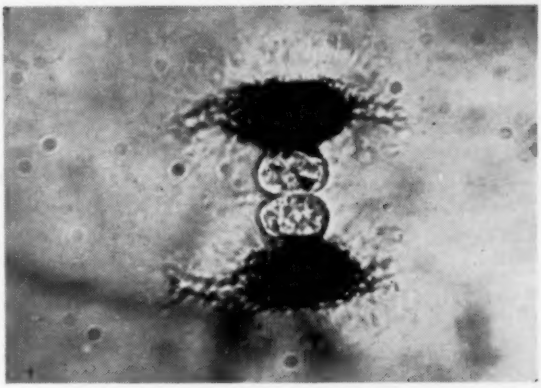

FIGURE 4—Cell division in *Staurastrum Seboldi.*

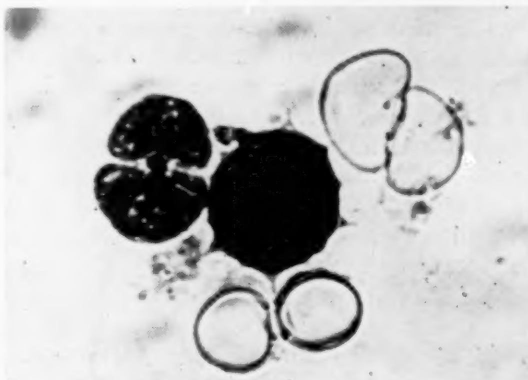

FIGURE 5—Sexual reproduction in *Cosmarium circulare* showing empty cells and zygospore.

Desmids are wholly fresh water organisms and the group is extremely widespread. For the most part, they are strictly aquatic but some grow in moist terrestrial habitats such as moist soil or dripping rocks. They are found largely in acid or soft water habitats. Upland pools and peat bogs present the conditions under which these organisms thrive best. The most favorable seasons for their development are late spring and early summer. Some forms are found existing as part of the plankton by virtue of their added buoyancy due to radiating spines or arms. (Figs. 1 & 2) Most of the desmids either adhere to submerged aquatic plants, float free in shallow water, or live on the bottom of shallow pools. Very few occur in running streams.

A New Type Standard Size Cage for Rats and Other Small Animals

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This type of cage was designed in our laboratory for conducting experiments with small animals. It has been used here for several years and has proven very satisfactory for raising rats, mice, guinea pigs and other small animals. The chief advantages of this cage over other homemade cages is that it lends itself to prefabrication and easy assembly. We cut and assembled 60 cages in a few hours. It is sturdy, well constructed, materials economically priced, and easily obtained. Materials, locally purchased, cost $1.90, and this compares very favorably with that of other well constructed but much more expensive cages.

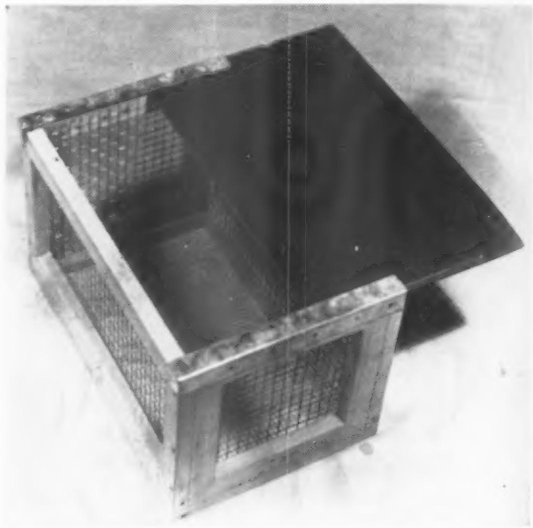
The interior of this cage is so well protected with hardware cloth that gnawing of wood is no problem. Wild rats, while well known for their excellent gnawing ability did no appreciable damage to the cages even though they were kept in them for a period of several weeks.

Instructions for building: For purposes of efficiency, it is suggested that all of the various parts of the cage be cut out before assembling is begun.

The sides and bottom units are put together separately. The sides, except the bottom unit, are covered with ½" mesh hardware cloth, using 4 penny nails for the wood and small staples to secure the hardware cloth. The bottom unit is assembled in a similar manner, but ¼" mesh hardware cloth is used.

The completed sides and bottom units are assembled as shown in the photograph and drawings. The interior of the cage is completely covered with hardware cloth to protect the wood from gnawing of the animals.

Metal angle irons are nailed to the tops of the end pieces; these form the groove in which the sliding top moves. A ¼" space is allowed for the sliding top and a portion of the angle iron is bent and nailed down in the back to form a stop for the sliding top. This type of top was used because it may be completely removed and thus facilitates handling animals and cleaning the cage. It also saves on the cost of hardware because hinges, hasp and woodscrews are not needed.

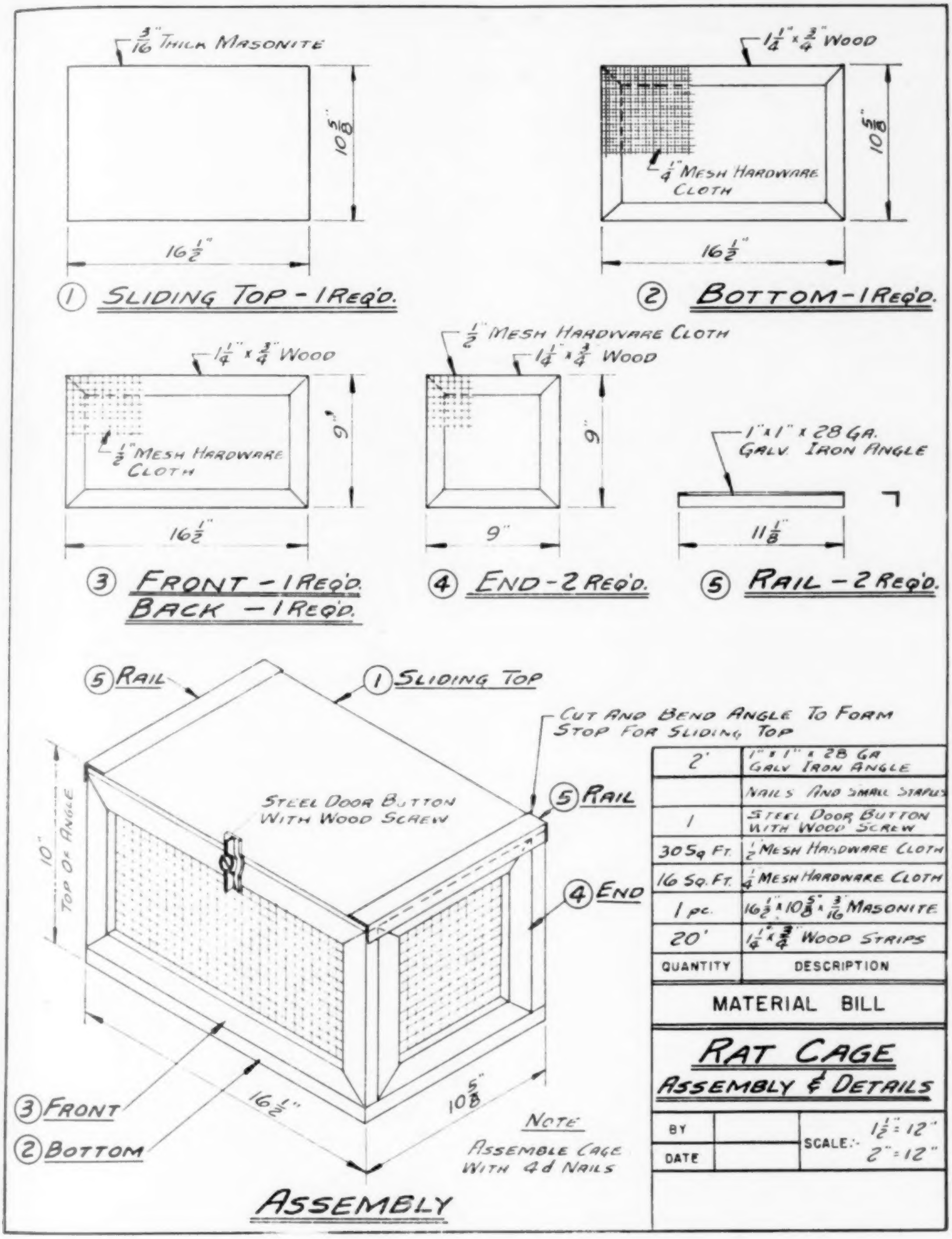


Completed cage.

A steel door button to avoid accidental opening of the cage is fastened with a wood screw as is shown in the drawing.

Our experience, using 60 of these cages over a period of 5 years, leads us to believe that they can be highly recommended for raising and studying small laboratory animals.

Wall charts may be obtained from the U. S. Dept. of Agriculture, Washington, D. C. These are: *What We Get From Trees*, 30" x 40", in color, M-5293; and *How A Tree Grows*, 16" x 22", M-5195. In the same letter ask for *Material to Help Teach Forest Conservation.*



Detailed Plans for Construction and Assembly of Small Animal Cage

A Fluorescent Illuminator for Still Photography

PAUL V. PRIOR
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DeKalb, Illinois

While taking a course in photography for science teachers and students, offered by Dr. H. L. Dean of the State University of Iowa, the construction of an inexpensive, portable fluorescent light for general photography was undertaken. When completed the lamp proved to be even more useful than was first anticipated. It may be used either vertically or horizontally, for copy work of any kind as well as taking still photographs of fairly large objects such as potted plants, laboratory equipment, portraits, small animals, etc. In addition to providing adequate diffuse illumination for black and white photography, the color temperature of the lamp was found to be sufficiently high to permit the use of daylight color film.[1] This feature is particularly desirable when using the popular 35 mm. camera because outdoor color film may then be used without the aid of filters or changing the film before a roll has been completely exposed.

The materials needed for the construction of the lamp are: one piece of ¼″ plywood 24″ square, a farm utility pan about 15″ in diameter and 4″ deep, a circular fluorescent light fixture with a white bulb 12″ in diameter and a few short bolts.

In assembling the lamp cut holes approximately eight inches in diameter in the center of the plywood and in the bottom of the utility pan. The pan and plywood may then be bolted together so that the holes in each coincide. The fluorescent fixture is easily dismantled and the tube clamps are bolted to the bottom of the pan centered around the hole. The tube may be placed in position and clamped on. After mounting the tube, the starter and ballast, which are included with the fixture are fastened to the back of the plywood. Electrical connections for the lamp are simple, since it is not necessary to disconnect the tube, starter, or ballast for as-

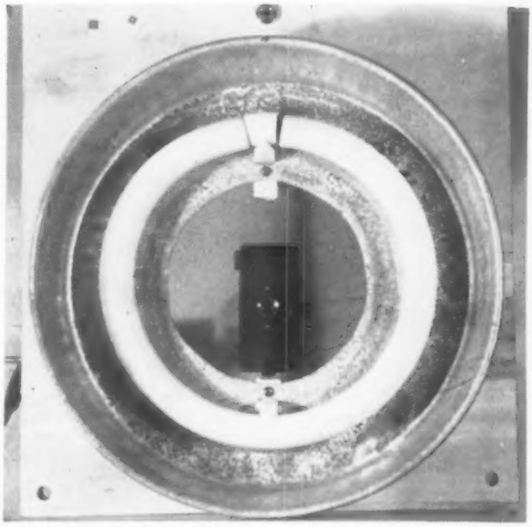

FIGURE 1—Fluorescent lamp and camera set up for horizontal photography.

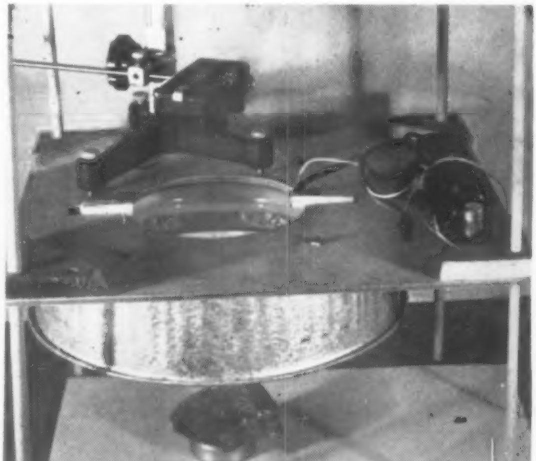

FIGURE 2—Fluorescent lamp and camera set up for vertical photography and copying. Note the ballast and starter fastened to the plywood back.

[1]Cool white fluorescent tubes are 4500° Kelvin. (General Electric Co.)

sembly. A wiring diagram is usually printed on the ballast case.

For vertical work the lamp may be supported by blocks; however, the author has found that legs made of ¼" doweling inserted through holes drilled in the corners of the plywood provided adequate support. (Fig. 2) By wedging the doweling up or down any desired height, up to the total length of the legs, can be obtained. For horizontal work two metal shelf supports may be bolted to one side of the plywood so that the lamp will stand upright.

In use the camera is aimed through the center of the eight inch hole in the lamp. (Fig. 1) Light meter readings may be taken in the same manner. It is desirable to provide some sort of stationary camera support since fast exposures are not possible with color film. A ring stand has given adequate camera support for vertical work. The author found that by fastening the reflex camera to the arm of a kymograph stylus support, focusing is easily and quickly done. Figure 1 shows the front view of the lamp and camera for horizontal use, and figure 2 shows the back of the lamp and the camera in position for vertical use.

Two of the described illuminators have been constructed for less than ten dollars each. They have proven to be useful in many situations where a portable, easily set up lamp is desired.

Letter to Biology Teachers-About Camping

Dear Reader,

Most of us teachers spend most of our lives indoors, of course. Our class rooms, assembly rooms, and laboratories have been scientifically designed to protect us, our students, and our equipment against the evils of our natural environment. Our homes likewise afford us shelter so that we can eat and sleep in safety and comfort. To be sure some of us supervise playgrounds or coach athletics out-of-doors; a few of us now have responsibilities at school camps; and some of us breathe the open air during some of our non-working hours. But most of us are cave-dwellers, willy nilly.

Unlike many cave-dwelling organisms, biology teachers have not become evolutionarily reduced to a state of blindness. There are many encouraging evidences that we sense the limitations of classroom education, and have an eye to the out-of-doors to supplement our indoor efforts in "teaching life." For instance, the number of coöperators in the N.A.B.T. Conservation Project attests that many biology teachers have seen the light outside the classroom window.

Straddling environments can be as uncomfortable as having one foot on a dock and one in a dancing dory. However, there are great assets for those who can handle indoor-outdoor teaching, just as there are advantages for wildlife along the edge between two habitats. Realizing that most of us need help in crossing school thresholds, our National Association of Biology Teachers has for some time been carrying on its Conservation Project. Now our organization has decided to take another step by establishing a Camping Committee.

COMMITTEE MEMBERS NEEDED

At the moment of writing, the composition of the committee is as diffuse as its plans. President Arthur Baker has asked me to be chairman to gather both committee members and ideas. As for members, any interested person who wants to work is welcome at this point. Members will be unpaid, ununiformed, and unsung. If so many of you write me that the committee threatens to be too large for efficiency, an autocratic Inner Circle will probably evolve to provide the requisite organization.

As for ideas, here are some starters for your reactions, both positive and negative:

SOME ADVANTAGES OF CAMPING

Camping is salutary *for us biology teachers* for several reasons. We find ourselves at camp in a different environment, with its various physical and biological components reminding us of natural laws which we had perhaps forgotten and revealing new phenomenona of which we had probably never dreamed. At first, nature helps heal our classroom scars; then we begin eagerly to collect experiences and junk to share with next year's class. Usually we become strengthened

physically as well as mentally. And sometimes we can even improve our economic condition, as camp counselors, camp directors, park naturalists, or guides.

Our camping helps *our students* too. Their natural enthusiasm for the out-of-doors may be augmented or reawakened as they hear us tell our own experiences related to the lesson at hand, thus increasing also their interest in the lesson. Wood anatomy, for instance, becomes more alive when the functions of plant hormones are related to the shape of suitable hot-dog sticks.

When *teachers and students* go camping together, the study of life can be at its best, rounding out the experiences gained in libraries and laboratories. School-yard exploration during a class period is more and more leading to extended field trips and to school camping enabling students to gain a more comprehensive view of life.

SOME PROBLEM FACING US

1. How can we help those teachers who must take the plunge into camping for the first time?
2. How can we help biology teachers adapt their knowledge and teaching methods to camp situations, which are so different from classrooms in many ways?
3. How can we help camp administrators realize the value of trained biologists in camp, instead of youngsters trained in one nature hobby only?
4. How can we help the sound development of school camping?

SOME METHODS TO TRY

1. Writing articles for *The American Biology Teacher*, to keep us up-to-date on camping as it relates to our profession.
2. Writing articles for journals of teachers of other subjects, indicating possible areas of cooperation.
3. Setting up at science meetings demonstrations of applications of biology to camping.
4. Arranging a symposium on biology in camps as part of a science meeting or teachers' workshop.
5. Working with organizations such as The Nature Conservancy for setting aside more relatively natural areas for school use.
6. Working with camp administrators to help them with campground conservation and nature programs.

WHO, ME?

Yes, you! Every biology teacher can help, even if he has never swatted a mosquito or had wood smoke in his eyes. Poor, tired, overworked teachers like you and me can talk up the subject of biology in camping, with our superiors, our peers, and (if we can find any) our inferiors. Those of you with an urge to do more, please send me a note giving me your ideas as to what you would like to do.

Don't wait for an answer from me, though. Just get started. I'll try to maintain some degree of coördination, so that two members don't write the same article! But I'm more worried about too little being done rather than too much.

Hoping to meet many of you in my mail,

Sincerely yours,
JOHN BRAINERD

Springfield College, Springfield, Mass.
Chairman, Camping Committee, NABT

NABT CONSERVATION PROJECT

The Handbook on Teaching Conservation and Resource-Use Education, prepared by the NABT National Conservation Committee, is completed and will be available for distribution early in 1955 according to Dr. Richard L. Weaver, Project Leader and Editor. It will contain over one-hundred case studies of outstanding techniques in teaching conservation in public schools.

The Bibliography of Free and Inexpensive Materials in Conservation Education has been completely revised by Muriel Beuschlein of Chicago Teachers College. It will be available as a reprint for ten cents and will also be included in *The Handbook*.

Reprints of the *Symposium on "Teaching Conservation"* held at the University of Wisconsin are available for ten cents.

Orders for *The Bibliography*, and advance orders for *The Handbook* should be sent to Richard L. Weaver, P. O. Box 2073, Ann Arbor, Michigan.

A list of Conservation Workshops has been prepared by the Workshop Committee under the Chairmanship of Bert Robinson and is available free from him, U. S. Soil Conservation Service, Washington, D. C.

Original Science Fiction Useful in Teaching the Geologic Time Table

JEAN E. COOPER
Senior High School Biology Instructor
Cheyenne, Wyoming

A great many of my biology students are avid readers of science fiction. I made a modified use of this interest in presenting the different periods of the geologic time table in beginning biology classes. I have never felt that my students obtained an adequate idea of the types of living things found during the various geologic periods from class discussion alone. In order to overcome this lack, to some extent, and also to add some spice to the biology classes, I assigned the writing of fiction stories about specific prehistoric animals. The students were to obtain information on plant types, climate, and habits of the assigned animal and other animals found during the period in which the main animal character lived. This factual information was to be incorporated into the story. The fictional report permitted a certain amount of anthropomorphism, but man was not to enter the picture except as an observer unless he actually lived during the assigned period. Background material, including pictures of the organisms, was made available in the laboratory.

Of course, as is always true, many of the students did not follow instructions and many did not not obtain or effectively use the necessary background material. However, I feel that the majority did learn something of the geologic periods and the different types of plants and animals living during the periods. The better stories were made available for all the students to read. In addition to learning some facts, some of the students also found that writing in biology can be fun. They were supposed to follow standard composition form. However, some wished to write poems instead of compositions and this was acceptable. Some added cartoons and other illustrations.

In addition to finding many of the stories amusing, I found that some of them presented rather good character studies of the authors. The character studies were entirely unintentional and in some cases rather startling.

Following are two of the stories which were written in this project. These were chosen for inclusion here because they represent two different approaches to the problem.

Adventures in the Jurassic Period

ROBERT JODER, Junior
Senior High School
Cheyenne, Wyoming

Considering the facts as they now stand in this day and age it is utterly impossible and illogical to transport one's self back through time to any desired age. However, if the time called for such an act I might bring myself to do it. Supposing it were possible to go backward in time to any age, there would probably be several different methods, such as a time capsule or time machine. I prefer the easier and less expensive way of putting one foot in front of the other in a series of motions.

At any rate, I arrived at my destination, the Jurassic Period. It was a strange place indeed. The vegetation was quite unlike anything you would be likely to run into in the 20th century. The majority of the land was swampy, with cattail-like plants projecting from the shallower parts. The land was cluttered with thick vegetation consisting of fern trees and moss. The thing that struck me as strange was the complete absence of grass.

My next step was to cross the swamp in a northeasterly direction. This posed a difficult problem. How was I going to cross that formidable swamp? After a little pondering,

I decided that if I could stretch my imagination so much as to think that I was in the age of reptiles, I could stretch it a little more and say that there was a foot bridge put there for my convenience. I intend to use this means of getting over obstacles in order to further my travels.

During my jaunt across the swamp, I came upon an animal that scientists of the 20th century flatter with the name Brontosaurus. It was a very convincing animal, referring of course, to its size, and could be compared to some humans existing in the 20th century. However, his impressiveness ended with his size. He had very little in the way of personality. He couldn't possibly be handsome, except maybe to another Brontosaurus. His only virtue seemed to be his ability to eat (he ate by drinking water containing water plants). He seemed to be utterly brainless because he had only one pound of brain to all thirty-five tons of flesh and bone.

Every once in a while this monstrosity would lift his head and gaze around as if he were expecting the untimely arrival of some enemy. This was a possibility considered by all inhabitants of the period because it meant survival or death.

As I continued my journey, I came upon many scenes and heard many sounds. I saw a huge animal that walked on his hind legs, ripping the last pieces of flesh from the bones of some hapless creature that was now unrecognizable. The sounds of animals came to me as they led their daily lives in the deep depths of jungle. The scream of some animal came crawling and slithering through the air as it drew its last breath of life. Flying reptiles filled the air in their search for food. I came upon many graveyards where bones were bleached white in the sun showing the end of the trail followed eventually by the rest. The steaming humidity of the air, combined with what I saw, made my flesh crawl and my backbone quiver.

Finally, as the sun made its descent in the west, a change came over the land. As the sun cast its last golden rays across the swamp and trees, a silence and tranquility came to cover the horror of the day. It was almost as if love and peace had invaded the jungle and made it a living paradise. This could not last. This was but an intermission between acts or a prelude to a seemingly unreal drama. When the sun lifted its head above the mountains in the east and again put its golden rays upon the land, all the horror of the preceding day would again be relived and reinacted with the result being, as before, death.

My Daily Assignment

KATHRYN FOWLER, Junior
Senior High School
Cheyenne, Wyoming

I'm a newspaper reporter for the Daily Icicle. The other day my newspaper assignment was to interview the president of our fair and very cold land. He is *Mr. Synthetoceras*, the first three-horned mammal ever to be president. He thought I was a bit odd, I know, but it was my daily assignment. I want to relate some of the unusual answers I received from our president as I asked him the odd questions. May I add that I am a very good and close friend of the president? Here are a few of the many questions and answers I received:

1. "What is your name?" "Synthetoceras."
2. "What is your address?" "President's Mansion on Icecube Street with a volcano on each side. The volcanoes erupt only once a week but I don't get in the way."
3. "What is your phone number?" "Well, we just had a new phone put in—let's see was it Pliocene 9-5463 or Miocene 9-5463? Oh, I think it was Pliocene 9-5463."
4. "When is your birthday?" "Oh, my goodness, my mother never told me that. It was quite a while ago because I'm getting old and I have only about one million years to live."
5. "Where were you born?" "I was born right here in the City Icepital."
6. "What are some of your plans for the future?" "One plan is to try to figure out some way to help our friend Pliohippus (the horse) to grow three horns, big horns like mine, so he can learn to fight his own battles in Congress instead of running away."
7. "What do you do in your spare time?" "Well, most of my spare time is spent

in waxing and shining my three horns. They are my pride and joy as you know and I don't want them dull. I also like to play marbles with Amphicyon (the dog)."

8. "What is the present outlook for the world of the future?" "That is a very hard question to answer because so many strange things have been happening lately. The weather is extremely cold and some of our friends are leaving the country, and some just up and disappear like the American Rhinoceros. The small animals of our kingdom have no protection except their speed. Most of our friends have grown to enormous sizes and many have sprouted horns for protection. The buffalo-deer cow has done such a thing. But the American Rhinoceros is still the only one with a horn on it nose. The grass is getting shorter for vegetarians and the herbage is getting heavier. The members of the cat family are now meat eaters. The near-elephants have become real elephants and mastodons with great tusks. An ice-age is coming and I think it will be within the next ten million years."

These were a few answers I received from our great President Synthetoceras.

Secondary Root Demonstration

HARPER FOLLANSBEE
Biology Department, Phillips Academy
Andover, Massachusetts

A very simple yet effective demonstration of the irregularity of the branching pattern of secondary roots from their origin in the pericycle of the primary root central cylinder may be set up for the cost of one good sized carrot.

1. Soak the carrot in a bowl of water overnight.
2. Section the carrot longitudinally into two equal halves with any large kitchen knife.
3. Allow the carrot halves to dry out for approximately twenty-four hours until the central cylinder cracks away from the cortex.
4. Re-soak the carrot halves in a bowl of water overnight.
5. Starting at the tip of one of the halves, insert the end of your thumb under the central cylinder and between it and the cortex. Pry up gently on the central cylinder separating it from the rest of the carrot.
6. As you work your way up the carrot, it will be necessary to loosen the central cylinder from time to time by holding the central part of the root firmly in one hand and forcing the cortex apart from it with the thumb of the other hand. Repeat this process on the other side of the central cylinder. Then reinsert your thumb and pry upward once again on the central cylinder.

If followed carefully, this procedure will result in the separation of the central cylinder, in one part, from the rest of the root. Secondary roots will remain attached to the central cylinder and their origin from that structure, as well as the lack of any set pattern to their branching, will be readily seen at a glance. Furthermore, the holes where the roots penetrated through the cortex will remain as additional evidence of their method of growth.

These parts may be displayed in a shallow tray accompanied by an explanatory card calling attention to the significant structures and their arrangement. A small amount of water should be added to the bottom of the tray to keep the tissues moist and turgid. The other half of the carrot may be added to the tray as a demonstration of a longitudinal section of a carrot root. The display will last for two to three days.

Outstanding Biology Teachers

Two high school biology teachers, Frederick Greaves, Roosevelt High School, Seattle, Washington, and Albert Hunt, Bellingham High School, Bellingham, Washington, have been awarded John Hay Whitney Foundation grants for study in the humanities at Columbia and Yale Universities.

A CHALLENGE!

A Message From Your President

ARTHUR I. BAKER

Crystal Lake High School
Crystal Lake, Illinois

You have listened long, and with bored indifference, to please from your officers to reach for the stars. "Double NABT Membership!" they tell you. To this, I used to say, "Yah, that's easier said than done. Let 'em come out on the firing line and see how it goes."

But wait—this is different. This is not asking you to reach for the stars. This is a cold, realistic fact. All I am asking is for you to do what has been done. *Can You Match Illinois?* This is a challenge, and if accepted, watch NABT grow in numbers and service.

Examine the figures below—then get on the band wagon of a greater future for NABT.

State population is taken from 1950 census and rounded off to the nearest 100,000. The anticipated number of biology teachers in each state is estimated from the ratio existing in the state of Illinois (with strong leanings on the conservative side) and the number of members are from our mailing lists as of December, 1953. Circulation figures do not include institutional members.

State	Population	Estimated Biology Teachers	Journal Circulation	Estimated Potential Circulation	Per Cent Achievement on Estimated Potential Circulation
Alabama	3.100.000	310	17	103	16.5
Arizona	800,000	80	10	27	37
Arkansas	1,900,000	190	21	64	33
California	10.500,000	1050	143	350	41
Colorado	1,300,000	130	17	44	39
Connecticut	2,000,000	200	48	67	72
Delaware	300,000	30	11	10	110
District of Col.	800,000	80	24	26	92
Florida	2,800,000	280	26	94	28
Georgia	3,500,000	350	24	117	21
Idaho	600,000	60	9	20	45
Illinois	8,700,000	870	322	290	111
Indiana	4,900,000	400	108	134	81
Iowa	2,600,000	260	56	87	64.5
Kansas	1,900,000	190	49	64	76.5
Kentucky	2 900,000	290	13	97	13.5
Louisiana	2,600,000	260	20	87	23
Maine	900,000	90	8	30	26.5
Maryland	2,300,000	230	47	77	61
Massachusetts	4,600,000	460	100	154	65
Michigan	6,200,000	630	116	230	51
Minnesota	3,000,000	300	32	100	32
Mississippi	2,100,000	210	19	70	27
Missouri	4,000,000	400	47	134	35
Montana	600,000	60	24	20	120
Nebraska	1,300,000	130	19	44	43
Nevada	100,000	10	4	4	100
New Hampshire	500,000	50	22	17	118
New Jersey	4,800,000	480	60	160	37.5
New Mexico	700,000	70	12	24	50
New York	15,000,000	1500	207	500	41.5
North Carolina	4,000,000	400	95	134	71
North Dakota	600,000	60	6	20	30
Ohio	7,900,000	790	199	264	75.5
Oklahoma	2,200,000	220	33	74	44.5
Oregon	1,500,000	150	33	50	66
Pennsylvania	10,500,000	1050	208	350	59.5
Rhode Island	800,000	80	14	27	52
South Dakota	700,000	70	5	24	21
South Carolina	2,100,000	210	12	70	17
Tennessee	3,300,000	330	26	110	23.5
Texas	7,700,000	770	50	257	19.5
Utah	700,000	70	12	24	50
Vermont	400,000	40	12	14	86
Virginia	3,300,000	330	47	110	43
Washington	2,400,000	240	16	80	20
West Virginia	2,000,000	200	15	67	22
Wisconsin	3,400,000	340	89	114	78
Wyoming	290,000	29	6	10	60
			2513	5044	

. Books for Biologists .

FOTHERGILL, PHILIP G. *Historical Aspects of Organic Evolution.* Philosophical Library, New York. xvii plus 427 pp. 1953. $6.00.

Notwithstanding the large number of books that have been written on evolution, not until the appearance of Dr. Fothergill's volume has one appeared that has so thoroughly covered all phases of this frequently controversial field. The title itself is slightly inaccurate since not only does the book give a complete history of evolution from practically prehistoric times through to the familiar work of modern day geneticists, but more than half the book deals with a concise appraisal of modern theories of organic evolution. This section is of great interest to all biologists and can serve as excellent reference material. The superb eight page epilogue should be required reading for all college biology students.

BROTHER G. NICHOLAS, F.S.C., La Salle High School, Cumberland, Maryland

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SMITH, ELLA THEA. *Exploring Biology.* Harcourt, Brace & Co., New York. 579 pp. 1954. $4.12.

Everyone concerned with this fourth edition of a well known textbook is to be heartily congratulated for producing what is probably the best looking biology text on the market today. But congratulations are also to be extended on the book content. A great effort has been made to have the very latest research results incorporated into the illustrations and the text. There are countless evidences that this has been successfully done. The study aids at the end of each chapter contain not only unusual bibliography listings which are annotated but excellent lists of project suggestions.

There is a combination of the functional and morphological approach which some teachers may find confusing. Many may be disappointed in the brief treatment of insects and the ignoring of the phyla names of some of the invertebrates. There are several instances, e.g. nucleic acid, where terms, new to even many teachers, are insufficiently explained.

However, there are so many instances where this book is superior to most books in text content that one may safely list this as an outstanding high school biology textbook. The author's treatment of the chemical and physical background of so many biological problems and the up-to-date version of genetics are refreshing in a high school book. It should be carefully examined in the choosing of your next text.

PAUL KLINGE
Co-Editor, ABT

HAMILTON, HOWARD L. (Reviser). *Lillie's Development of the Chick: An Introduction to Embryology.* 3rd Revised Ed. Henry Holt and Company, New York. xv plus 624 pp. illus. 1952. $8.50.

Doctor Hamilton has done an outstanding job of revising Doctor Lillie's monograph and modernizing it. The revision remains essentially descriptive in context but follows current trends by including more experimental, comparative and historical information.

The chapters dealing with the nervous and urogenital systems and the period from egg laying to formation of the first somite have been revised completely. A new chapter on the integument is included. Noteworthy are the many new and excellent illustrations (in general, the quality of the illustrations remains variable), the illustrative and condensed description of development by stages and the comprehensive bibliography (32 pages). This much-needed modernization of Doctor Lillie's book insures its continuance as a classic in the field.

ROBERT L. GERING
Ecological Research
University of Utah

HARRIS, J. R. *An Angler's Entomology.* Frederick A. Praeger, Inc., New York. 268 pp. illus. 1952.

Of the many volumes on angling and entomology this book is an outstanding publication merging the two areas. Most of the insects identified in this British book are also native to the streams and lakes of the north central United States. The color plates are superior, and the keys for identification are well organized so that an interested layman can use them without difficulty. As a biologist and a fly fisherman I can highly recommend this book for both the angling enthusiast and the entomologist.

WILLIAM M. SMITH
Thomas Carr Howe High School
Indianapolis, Indiana

BEATY, JOHN Y. *Plant Breeding for Everyone.* Charles T. Branford Co., Boston 16, Mass. 102 pp. illus. 1954. $2.75.

How to go about the selection, breeding, development, and propagation of new plant varieties is told and explained in simple language by a former associate of Luther Burbank. Life science teachers will find this a valuable reference book for supplementary reading and student projects. The final chapter is excellent as a supplement to class study of heredity. The book is well-illustrated.

THE STAFF

(Continued on page 24)

"Biology in the News"

THE LAND OF THE SUN, Lincoln Barnett, *Life*, April 5, 1954, pp. 72-93.

The dryness of the desert, its torrential rains and floods, the remarkable plants and animals, and some of the means they use to survive in a land where food and water are never plentiful are beautifully pictured and described. Several copies of this set of pictures deserve a place in your permanent files.

THE FLOWERING FOREST OF JOE GABLE, Milton Lehman, *Sat. Ev. Post*, March 20, 1954, pp. 28-29 & 102-110.

Joe Gable loves azaleas and rhododendrons. He raises them, not for profit, not for fame, but because he enjoys devoting his life to producing plants which increase the joy of living for others as well as for himself. His methods and the spirit behind them are described.

GRASS IS MAD AT ME, Robert M. Yoder, *Sat. Ev. Post*, March 27, 1954, pp. 36 & 121-122.

This article contains little information about the best way to produce a lawn, but it is one which might provoke some lively discussion as to the proper methods of preparing the seed bed and sowing the grass seed.

FISHING WITH A WORM, Lee Wulff, *Collier's*, April 16, 1954, pp. 36-38.

One of several articles on fish and fishing. From bait to bite is graphically described. Some very fine color pictures are included in the article.

NOW—BREAD FROM THE SEA, Bill Davidson, *Collier's*, April 16, 1954, pp. 62-66.

Algae are just "green water scums" to most people. They may soon become one of our most important sources of food. How Chlorella, a single-celled green alga, can satisfy our needs for the basic nutrients and its remarkable powers of reproduction are welcome news to those who fear famine as our population increases.

CHILDHOOD DISEASES IN ADULTS, Maxine Davis, *Good Housekeeping*, April 1954, pp. 168-171.

Measles, mumps and other diseases of childhood can happen at any age. The older we are the more severe they may be. How to avoid these diseases and what to do if exposed or stricken are described in some detail.

WHAT YOU SHOULD KNOW ABOUT LUMBER, Walt Durbahn, *American Magazine*, April 1954, pp. 66-67.

Tips on varieties, grades and sizes of wood needed for do-it-yourself projects. A very useful chart is included. The article may stimulate your better students to learn more about the kinds and distribution of timber trees, or to collect samples of the various kinds of wood used as lumber.

NABT CONDUCTS WORK CONFERENCE IN FLORIDA

The National Association of Biology Teachers conducted a ten-day work conference on biology teaching at the University of Florida, Gainesville, August 28 to September 6, with ninety scientists, high school teachers, college instructors and administrators, and representatives of state departments of education, in attendance. The conference was held in conjunction with the annual meeting of the American Institute of Biological Sciences.

NABT is to be congratulated upon being able to give leadership to such an important and outstanding undertaking. The results should prove most helpful in suggesting some solutions to one of our most important educational problems today.

The conference was underwritten by a $15,000 grant from the National Science Foundation.

President Arthur J. Baker announced the following as leaders of the conference. Dr. Richard L. Weaver, University of Michigan and Dr. Samuel Meyer, Florida State University served as Co-Directors of the conference and selected the delegates. Dr. Ned Bingham, University of Florida, Dr. W. Hugh Stickler, Florida State University, and Dr. George Jeffers, Longwood College served as staff members. Dr. Harvey Stork of Carleton College served as chairman of the Steering Committee.

The delegates considered the content needed in high school and college biology programs, the problems of teaching biology at both levels, and developed recommendations for the improvement of biology teaching, particularly in the southeastern states. A Review Panel of State Superintendents of Public Instruction made suggestions for implementation of the conference recommendations.

Complete proceedings of this conference will be published in the January 1955 issue of *The American Biology Teacher.*

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Bio-Buy-Lines

BOOKS

(Continued from page 21)

CLARK, EUGENIE. *Lady with a Spear*, Harper & Bros., New York. xii plus 243 pp. illus. 1953.

This Book-of-the-Month Club selection more than justifies itself. Here is another book of the sea with both literary and scientific flavor of highest quality. Dr. Clark's quarter century of interest in fishes began with weekly trips to the Old Aquarium with her Japanese mother in Manhattan and led on to a distinguished career which is, we hope, far from ended. Her exploits are recited with humor and charm, but entirely in keeping with the scholarly attitudes befitting a research associate in the Department of Animal Behavior at the American Museum of Natural History. You'll not regret reading this book.

CHARLES E. PACKARD
Randolph-Macon College
Ashland, Virginia